Biological Data of Arctic Char, *Salvelinus alpinus*, from Heintzelman Lake, Quttinirpaaq National Park, Nunavut

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Babaluk, J.A., Wastle, R.J., Johnson, J.D., Troke, B.G., and Reist, J.D. 2009. Biological data of Arctic char, *Salvelinus alpinus*, from Heintzelman Lake, Quttinirpaaq National Park, Nunavut. Can. Data Rep. Fish. Aquat. Sci. 1216: v + 27 p.

Selected biological data collected in 1995 and 2001 for Arctic char, *Salvelinus alpinus*, from Heintzelman Lake, Quttinirpaaq National Park, Nunavut are tabulated and graphically represented.

Key words: Arctic char; Ellesmere Island; Heintzelman Lake; lake survey; Quttinirpaaq National Park.

RÉSUMÉ

Babaluk, J.A., Wastle, R.J., Johnson, J.D., Troke, B.G., and Reist, J.D. 2009. Biological data of Arctic char, *Salvelinus alpinus*, from Heintzelman Lake, Quttinirpaaq National Park, Nunavut. Can. Data Rep. Fish. Aquat. Sci. 1216: v + 27 p.

Certaines données biologiques recueillies en 1995 et en 2001 sur l'omble chevalier (*Salvelinus alpinus*) du lac Heintzelman, situé dans le parc national Quttinirpaaq (Nunavut), sont réunies et présentées dans un graphique.

Mots-clés: omble chevalier; île d'Ellesmere; lac Heintzelman; relevé des lacs; parc national Quttinirpaaq.

INTRODUCTION

A basic understanding of the biology and diversity of the Arctic char, *Salvelinus alpinus*, populations in Quttinirpaaq National Park, Nunavut is fundamental to Parks Canada's long-term conservation and management plans for these fish (Parks Canada 1994). Arctic char is the only freshwater fish species known from lakes in the Canadian High Arctic including those in Quttinirpaaq National Park (Scott and Crossman 1973; Parks Canada 1994). However, the species exhibits great diversity at a number of levels below that of species including: a) life history type (e.g., migratory or non-migratory), b) ecological type (e.g., pelagic or benthic forms), c) trophic type (e.g., planktivore or piscivore), d) evolutionary lineages (e.g., subspecies, biological stocks), and, e) variants within many of the above types (e.g., variable life histories including possible switching from migratory to non-migratory strategies). This diversity can be observed through a number of techniques but is best understood using several complementary approaches such as: a) morphology to understand body form and function, b) genetics to delineate groups using DNA chemistry, c) stable isotopes and diet to determine trophic pattern, d) population dynamics using age and size structure to monitor population health, and e) otolith microchemistry to determine life history patterns and discriminate stocks or other groupings.

Fisheries and Oceans Canada (DFO), in collaboration with Parks Canada, has been assessing the diversity in Quttinirpaaq National Park Arctic char populations by these various methods since 1990. The majority of the work has centred on the Arctic char of Lake Hazen (e.g., Reist et al. 1995; Babaluk et al. 1997, 2001; Guiguer et al. 2002; Babaluk et al. 2007a) but as opportunities have presented themselves, Arctic char populations in other lakes within the park were surveyed (Babaluk et al. 2007b). This report presents biological data of Arctic char from Heintzelman Lake, a lake within Quttinirpaaq National Park, for which data have not been previously reported.

MATERIALS AND METHODS

DESCRIPTION OF THE STUDY AREA

Heintzelman Lake (81° 42' N, 66° 56' W) is located in Quttinirpaaq National Park on the northern end of Ellesmere Island, Nunavut, Canada (Fig. 1). The lake was first visited in the summer of 1882 by Private Biederbick (United States Army) and also later that same year by a ground expedition led by Lieutenant Adolphus Greely, leader of the ill-fated Lady Franklin Bay Expedition of 1881-1884 to

the area (Greely 1886). The lake was named after Major General Samuel Heintzelman, a commander of note in the US Civil War (Hattersley-Smith 1998).

Heintzelman Lake is small (ca. 9 km long, 1.5 km wide) and shallow (maximum recorded depth = 15 m; authors' unpublished data). The lake drains into the sea (Discovery Harbour, a semi-enclosed embayment on the north side of Lady Franklin Bay) via a relatively short (ca. 10 km) unnamed river (Fig. 1). The river drops in elevation about 70 m over its course to the sea. There is no *aufeis* build-up at the sea indicating the river likely ceases flowing during winter and there appears to be no barriers to fish movement (Smith 1999). There are no glaciers present in the drainage basin or vicinity of the lake (Smith 1999), thus the hydrological regime critical for char migrations appears to depend solely upon early season snow and ice melt for possible out-migrations and late season precipitation events for in-migrations (see Svenning and Gullestad 2002 for relationship of river flows and char migrations). No limnological survey of the lake has been conducted, thus information is limited. So far as is known the lake is ultra-oligotrophic and also cold monomictic (i.e., uniformly freshwater throughout), although some meromictic lakes (i.e., those with saltwater lenses at depth) occur in the area (Stewart 1994). Although the deepest sounding to date is 15 m, the lake may be moderately deeper given its enclosed nature among cliffs forming the valley walls, the summer persistence of central lake ice at least in colder years, and the fjord-like nature of the land forms in the area (Greely 1886). The lake is fed by a number of high-gradient tundra streams, the most prominent of which is the unnamed stream about 20 km long draining Black Rock Vale which enters the northern end of the lake (Fig. 1). Heintzelman Lake is the only lake present in this small water system. Various water chemistry parameters obtained from one sample collected through the ice in 1995 (Babaluk et al. 1999) and an open-water sample collected in 2001 (authors' unpublished data) appear to be atypical for lakes in the area. Heintzelman Lake waters have relatively high concentrations of Na, Cl, Ca, S, and Mg. During autumn treks of 1882, Greely (1886) noted the presence of driftwood including large trees partially buried in sediments 20 feet above the lake level, 8-10 miles from the sea and 300 feet above sea level. Water chemistry, Greely's observations, and marine shells in the area, all indicate a relatively recent association with the sea which is confirmed by evidence of late Pleistocene marine incursions in the area (Smith 1999). Furthermore, adjacent land areas of extreme northeast Ellesmere Island perhaps also including the area of Heintzelman Lake appear to have remained unglaciated at glacial maximum 8000-10 000 years ago (Smith 1999), thus may have acted as a local refugium for chars in the area. Thus, char in some lakes in this area may have originated either as glacial relict populations or through emigration by anadromous fish, or perhaps by both mechanisms.

COLLECTION METHODS

Between May 7-13, 1995, 26 Arctic char were captured at 3-4 m depth through the ice in Heintzelman Lake by angling or multi-mesh nylon multifilament sinking gillnets (gangs made up of 10, 12.5, 16, 19, 22, and 25 mm and 10, 19, 33, 45, 55, and 60 mm bar-mesh) similar to those described by Johnson (1983), and an additional 12 char were angled through the ice by Parks Canada personnel on June 15-16, 1995 to yield a total of 38 fish captured in 1995 (Fig. 1). On August 6-7, 2001, 337 char were captured by gillnets, as described above, set in open water at four sites in the lake, with depths being 0-4 m for the northern two sites and 0-15 m for the southern two sites (Fig. 1).

BIOLOGICAL DATA

Due to logistical constraints, no biological variables were taken in the field. All Arctic char collected were frozen whole in the field and transported to DFO (Winnipeg) for subsequent processing. This included measuring (fork length, nearest mm) and weighing (nearest g) thawed individuals, assessment of sex (F = female, M = male, and U = unknown/uncertain), and fecundity (total egg count), where applicable. Otoliths were collected for age determination. Ages were determined using the technique described in Reist et al. (1995) and criteria described by Nordeng (1961) and Chilton and Beamish (1982).

For this study, thawed fork lengths and weights were converted to "fresh" fork lengths and weights using the following equations from Babaluk et al. (2007a):

Fresh fork length, mm = 1.016721 (thawed fork length, mm)

Fresh weight, g = 1.013071 (thawed weight, g).

"Fresh" length and weight data are presented in the subsequent tables and have been used to produce applicable figures. A "blank value" in a table indicates that the parameter was not assessed or was not applicable for that fish.

Otoliths from Heintzelman Lake Arctic char collected in 1995 and 2001 are archived at Fisheries and Oceans Canada (501 University Crescent, Winnipeg, Manitoba, R3T 2N6, Canada). Selected, frozen, processed Heintzelman Lake char are also archived at Fisheries and Oceans Canada in

Winnipeg. An electronic version of the raw data is available from the authors at Fisheries and Oceans Canada in Winnipeg.

DATA ANALYSIS

Length, weight, age, and fecundity data were analysed using SigmaStat® (3.1) and figures were created using SigmaPlot 2000® and CorelDraw 10® personal computer software programs.

Weight and length data were logarithmically transformed and weight-length relationships were described by the equation:

$$Log_{10}W = a + b\ (log_{10}L)$$

where: W = weight in grams
L = fork length in millimeters
a = Y axis intercept
b = slope of the regression line.

Fecundity-length relationships were described by the equation:

$$Log_{10}F = a + b\ (log_{10}L)$$

where: F = number of eggs
L = fork length in millimeters
a = Y axis intercept
b = slope of the regression line.

DATA PRESENTATION

Biological data for individual Arctic char collected from Heintzelman Lake in 1995 and 2001 are presented in Tables 1 and 2, respectively.

The char from the two collection periods in 1995 were captured by different methods (gillnet and angling). However, the fish were inadvertently grouped together for processing because we were

unable to discern the capture method for individual fish. As a result, the 1995 data from all fish presented here may not be representative of the population (angling has a bias towards larger fish). Because of the relatively small number of Arctic char captured in Heintzelman Lake in 1995 (n = 38), the sexes were combined for subsequent analyses. For the 1995 collection, the following analyses are presented: length frequency distribution (Fig. 2), age frequency distribution (Fig. 3), relationship between fork length and age (i.e., growth rate) (Fig. 4), relationship between fork length and body weight, including length-weight equation (Fig. 5), and relationship between fecundity and fork length, including fecundity-length equation (Fig. 6).

A large number of Arctic char were captured in Heintzelman Lake in 2001 (n = 337). For subsequent analyses, males and females were separated as well as combined. The following analyses are presented: length frequency distributions (Fig. 7), age frequency distributions (Fig. 8), relationships between fork length and age (Fig. 9), relationships between fork length and body weight, including length-weight equations (Fig. 10), and relationship between fecundity and fork length, including fecundity-length equation (Fig. 11).

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Table 1. Biological data for Arctic char captured by angling or gillnet in Heintzelman Lake in May and June, 1995.

Sample no.	Processing no.	Fork length (mm)	Weight (g)	Sex	Age (yr+)	Fecundity
1	42300	177	126	F	9	
2	42301	243	261	M	8	
3	42302	234	229	F	15	
4	42303	206	172	F	13	162
5	42304	188	126	F	9	
6	42305	231	227	F	17	
7	42306	187	146	M	12	
8	42307	198	174	M	12	
9	42308	208	168	U	7	
10	42309	198	164	F	13	94
11	42310	217	231	F	17	68
12	42311	232	223	F	28	217
13	42312	204	172	M	8	
14	42313	181	124	M	12	
15	42314	193	146	F	9	
16	42315	180	182	M	20	
17	42316	198	154	M	21	
18	42317	97	18	U	3	
19	42318	171	103	M	9	
20	42319	172	109	F	14	74
21	42320	125	38	F	5	
22	42321	159	81	F	8	
23	42322	183	124	M	9	
24	42323	203	170	M	13	
25	42324	224	209	M	24	
26	42325	200	160	F	9	116
27	42326	301	472	M	25	
28	42327	295	365	M	25	
29	42328	246	292	F	20	173
30	42329	195	152	M	23	
31	42330	252	314	M	11	
32	42331	269	342	F	13	
33	42332	236	243	F	10	
34	42333	258	344	F	14	
35	42334	296	553	F	16	328
36	42335	285	511	F	14	242
37	42336	235	225	F	9	
38	42337	336	565	F	11	

Table 2. Biological data for Arctic char captured by gillnet in Heintzelman Lake, August 6-7, 2001.

Sample no.	Processing no.	Fork length (mm)	Weight (g)	Sex	Age (yr+)	Fecundity
1	47572	248	135	M	14	
2	47573	323	242	M	17	
3	47574	303	236	M	18	
4	47575	291	166	F	26	
5	47576	231	109	M	10	
6	47577	225	87	F	9	
7	47578	260	153	F	18	194
8	47579	328	238	M	15	
9	47580	305	262	M	7	
10	47581	265	134	F	10	
11	47582	312	242	M	19	
12	47583	299	200	F	21	412
13	47584	199	67	F	19	96
14	47585	218	97	F	16	125
15	47586	215	85	F	23	93
16	47587	203	65	M	7	
17	47588	194	59	F	10	
18	47589	187	58	M	18	
19	47590	189	50	F	8	
20	47591	187	56	F	8	
21	47592	201	49	F	18	
22	47593	200	67	F	11	
23	47594	215	80	M	16	
24	47595	207	75	F	8	
25	47597	174	53	M	9	
26	47598	187	64	M	18	
27	47599	194	54	M	27	
28	47600	154	41	M	7	
29	47601	208	82	F	10	210
30	47602	176	54	M	17	
31	47603	219	104	F	18	91
32	47604	216	85	F	10	137
33	47605	200	77	F	22	106
34	47606	164	49	M	8	
35	47607	200	67	M	23	
36	47608	176	52	F	11	
37	47609	184	57	F	6	
38	47610	203	76	F	8	
39	47611	204	80	M	17	
40	47612	200	88	M	15	
41	47613	222	96	M	23	
42	47614	189	57	F	24	66
43	47615	194	75	M	30	
44	47616	174	53	M	10	

Table 2. Continued.

Sample no.	Processing no.	Fork length (mm)	Weight (g)	Sex	Age (yr+)	Fecundity
45	47617	220	95	F	14	136
46	47618	174	65	M	9	
47	47619	197	64	F	12	104
48	47620	184	63	M	10	
49	47621	164	45	F	6	
50	47622	188	54	M	12	
51	47623	147	38	F	10	69
52	47624	186	45	F	21	
53	47625	174	44	M	9	
54	47626	170	53	M	11	
55	47627	210	79	F	7	
56	47628	177	60	M	13	
57	47629	176	57	M	9	
58	47630	206	79	M	16	
59	47631	190	67	M	14	
60	47632	174	49	M	9	
61	47633	187	62	M	14	
62	47634	231	96	F	13	
63	47635	199	79	M	20	
64	47636	160	35	M	6	
65	47637	196	70	M	15	
66	47638	205	79	M	21	
67	47639	204	71	F	16	84
68	47640	179	58	M	8	
69	47641	204	72	M	26	
70	47642	229	95	F	11	
71	47643	205	75	F	17	84
72	47644	238	115	F	14	241
73	47645	245	87	F	14	
74	47646	260	132	F	10	
75	47647	226	108	M	17	
76	47648	225	79	M	15	
77	47649	218	94	M	10	
78	47650	204	76	M	15	
79	47651	180	64	M	9	
80	47652	186	60	M	6	
81	47653	181	57	F	12	70
82	47654	189	65	M	14	
83	47655	182	53	F	17	48
84	47656	145	38	M	7	
85	47657	187	55	M	17	
86	47658	189	60	M	14	
87	47659	197	70	M	27	
88	47660	189	64	M	18	

Table 2. Continued.

Sample no.	Processing no.	Fork length (mm)	Weight (g)	Sex	Age (yr+)	Fecundity
89	47661	174	53	M	17	
90	47662	194	66	M	16	
91	47663	195	67	F	8	
92	47664	189	63	M	16	
93	47665	200	87	M	17	
94	47666	150	29	M	11	
95	47667	208	77	F	15	
96	47668	225	98	M	15	
97	47669	192	76	M	18	
98	47670	158	44	M	8	
99	47671	188	61	F	6	
100	47672	161	46	M	7	
101	47673	188	62	M	14	
102	47674	194	66	F	20	73
103	47675	200	66	F	18	58
104	47676	184	54	M	13	
105	47677	200	79	F	12	151
106	47678	176	53	M	8	
107	47679	215	71	M	9	
108	47680	156	33	M	9	
109	47681	177	54	F	11	52
110	47682	156	40	M	8	
111	47683	178	53	M	15	
112	47684	181	57	F	15	104
113	47685	195	68	F	17	122
114	47686	191	70	F	15	106
115	47687	171	49	F	16	82
116	47698	237	99	F	15	
117	47699	200	56	M	17	
118	47700	236	91	U	13	
119	47701	195	64	F	15	61
120	47702	261	102	F	34	
121	47703	204	59	F	17	
122	47704	120	15	U	3	
123	47705	215	68	F	14	
124	47706	190	68	M	13	
125	47707	190	59	M	8	
126	47708	217	75	F	18	
127	47709	197	71	M	18	
128	47710	238	126	F	15	221
129	47711	242	84	F	13	
130	47712	218	82	U	11	
131	47713	184		M	8	
132	47714	220	100	M	12	

Table 2. Continued.

Sample no.	Processing no.	Fork length (mm)	Weight (g)	Sex	Age (yr+)	Fecundity
133	47715	209	87	F	8	123
134	47716	225	93	F	11	
135	47717	210	74	M	14	
136	47718	266	144	U	15	
137	47719	235	109	F	26	147
138	47720	225	78	M	21	
139	47721	220	94	F	24	66
140	47722	225	94	F	17	
141	47723	204	88	M	12	
142	47724	219	83	F	26	68
143	47725	233	118	F	12	245
144	47726	194	65	M	14	
145	47727	296	175	M	16	
146	47728	199	76	M	15	
147	47729	215	92	M	15	
148	47730	236	109	F	15	56
149	47731	210	80	F	17	114
150	47732	177	56	M	13	
151	47733	175	52	M	8	
152	47734	196	71	M	14	
153	47735	188	66	F	19	73
154	47736	189	55	F	13	
155	47737	185	64	M	13	
156	47738	200	72	M	24	
157	47739	181	56	F	11	132
158	47740	195	64	M	19	
159	47741	239	87	M	16	
160	47742	238	96	F	26	
161	47743	215	77	F	14	
162	47744	210	80	U	12	
163	47745	218	96	M	7	
164	47746	227	98	F	20	201
165	47747	201	80	M	25	
166	47748	204	74	M	20	
167	47749	193	69	M	9	
168	47750	195	54	M	17	
169	47751	191	50	M	30	
170	47752	188	47	M	19	
171	47753	208	66	F	23	52
172	47754	198	68	M	29	
173	47755	181	53	M	9	
174	47756	161	41	M	8	
175	47757	235	117	F	18	192
176	47758	225	93	M	15	

Table 2. Continued.

Sample no.	Processing no.	Fork length (mm)	Weight (g)	Sex	Age (yr+)	Fecundity
177	47759	306	152	M	14	
178	47760	263	146	M	7	
179	47761	277	157	F	13	
180	47762	256	125	M	12	
181	47763	241	128	F	18	201
182	47764	362	337	F	9	
183	47765	272	105	F	18	
184	47766	259	141	U		
185	47767	272	149	U	19	
186	47768	255	151	F	11	
187	47769	316	209	F	28	
188	47770	194	59	F	17	78
189	47771	282	170	M	22	
190	47772	289	190	M	15	
191	47773	306	199	M	15	
192	47774	301	175	F	14	
193	47775	281	167	M	13	
194	47776	242	106	M	18	
195	47777	287	191	M	11	
196	47778	262	156	U	16	
197	47779	259	113	F	15	245
198	47780	316	208	M	17	
199	47781	258	142	M	13	
200	47782	265	137	M	14	
201	47783	249	106	U	15	
202	47784	301	191	F	15	
203	47785	185	58	F	14	92
204	47786	166	49	M	11	
205	47787	166	46	M	11	
206	47788	157	40	M	7	
207	47789	158	37	M	14	
208	47790	187	59	M	15	
209	47791	177	51	F	15	71
210	47792	187	53	U	8	
211	47793	169	44	U	7	
212	47794	145	36	M	8	
213	47795	258	127	U	15	
214	47796	316	198	F	22	228
215	47797	289	162	U	23	
216	47798	259	149	M	10	
217	47799	230	112	F	10	242
218	47800	230	103	M	12	
219	47801	215	86	M	15	
220	47802	286	200	F	16	345

Table 2. Continued.

Sample no.	Processing no.	Fork length (mm)	Weight (g)	Sex	Age (yr+)	Fecundity
221	47803	261	132	F	21	163
222	47804	331	262	M	15	
223	47805	192	64	U	15	
224	47806	197	69	M	20	
225	47807	170	43	F	7	
226	47808	156	43	M	7	
227	47809	179	56	M	8	
228	47810	157	49	M	8	
229	47811	255	129	F	24	209
230	47812	276	161	M	18	
231	47813	301	157	M	25	
232	47814	204	74	F	21	149
233	47815	248	112	F	25	151
234	47816	247	83	F	16	
235	47817	210	87	M	20	
236	47818	199	60	F	20	
237	47819	236	109	U	11	
238	47820	226	81	U	25	
239	47821	249	115	F	15	
240	47822	259	136	F	14	175
241	47823	200	66	F	19	89
242	47824	281	173	F	18	290
243	47825	188	63	M	14	
244	47826	225	93	F	10	
245	47827	271	134	F	18	
246	47828	249	129	F	20	232
247	47829	266	118	U	17	
248	47830	236	126	M	20	
249	47831	205	73	M	28	
250	47832	255	118	U	12	
251	47833	231	105	F	19	119
252	47834	249	89	F	24	
253	47835	240	117	M	8	
254	47836	209	66	M	18	
255	47837	199	64	F	23	
256	47838	235	96	F	10	
257	47839	150	40	F	7	27
258	47840	250	147	F	15	
259	47841	190	78	F	31	
260	47842	220	80	M	25	
261	47843	225	90	M	17	
262	47844	228	84	U	8	
263	47845	165	43	F	9	66
264	47846	136	27	M	5	

Table 2. Continued.

Sample no.	Processing no.	Fork length (mm)	Weight (g)	Sex	Age (yr+)	Fecundity
265	47847	127	19	F	5	
266	47848	147	30	M	6	
267	47849	188	69	M	7	
268	47850	158	42	M	10	
269	47851	185	55	M	13	
270	47852	163	44	M	13	
271	47853	171	52	M	10	
272	47854	183	61	M	8	
273	47855	184	60	M	13	
274	47856	187	53	U	10	
275	47857	168	49	M	7	
276	47858	186	66	M	6	
277	47859	166	46	M	8	
278	47860	181	52	F	7	
279	47861	191	61	F	10	
280	47862	190	56	U	6	
281	47863	203	75	M	17	
282	47864	182	51	M	8	
283	47865	161	37	F	8	67
284	47866	172	49	F	10	72
285	47867	184	62	F	15	38
286	47868	201	69	F	8	
287	47869	194	62	M	22	
288	47870	189	63	M	15	
289	47871	202	76	M	10	
290	47872	205	66	F	8	
291	47873	265	128	F	10	
292	47874	362	324	M	10	
293	47875	321	204	M	23	
294	47876	200	59	F	22	73
295	47877	267	139	F	17	230
296	47878	209	92	F	16	49
297	47879	228	99	M	12	
298	47880	296	162	F	21	
299	47881	283	179	F	13	
300	47882	101	10	U	3	
301	47883	111	12	F	3	
302	47884	109	12	U	3	
303	47885	101	9	U	3	
304	47886	110	12	U	3	
305	47887	92	8	U	3	
306	47888	282	141	F	17	
307	47889	318	212	M	18	
308	47890	248	130	M	12	

Table 2. Continued.

Sample no.	Processing no.	Fork length (mm)	Weight (g)	Sex	Age (yr+)	Fecundity
309	47891	299	198	F	25	
310	47892	281	176	F	18	259
311	47893	316	246	M	17	
312	47894	313	184	F	17	
313	47895	354	226	M	16	
314	47896	318	215	M	17	
315	47897	353	239	M	13	
316	47898	304	220	F	23	270
317	47899	401	452	M	28	
318	47900	309	213	M	20	
319	47901	249	98	M	17	
320	47902	231	108	M	10	
321	47903	301	189	M	19	
322	47904	277	150	F	15	
323	47905	254	148	M	10	
324	47906	164	46	M	11	
325	47907	212	79	F	13	142
326	47908	170	55	F	8	33
327	47909		13	U	3	
328	47910	120	16	M	5	
329	47911		11	U	3	
330	47912	106	12	U	3	
331	47913	118	13	M	3	
332	47914	111	14	U	3	
333	47915	127	18	F	5	
334	47916	101	9	M	3	
335	47917	108	11	F	4	
336	47918	114	14	M	3	
337	47919	128	18	F	5	

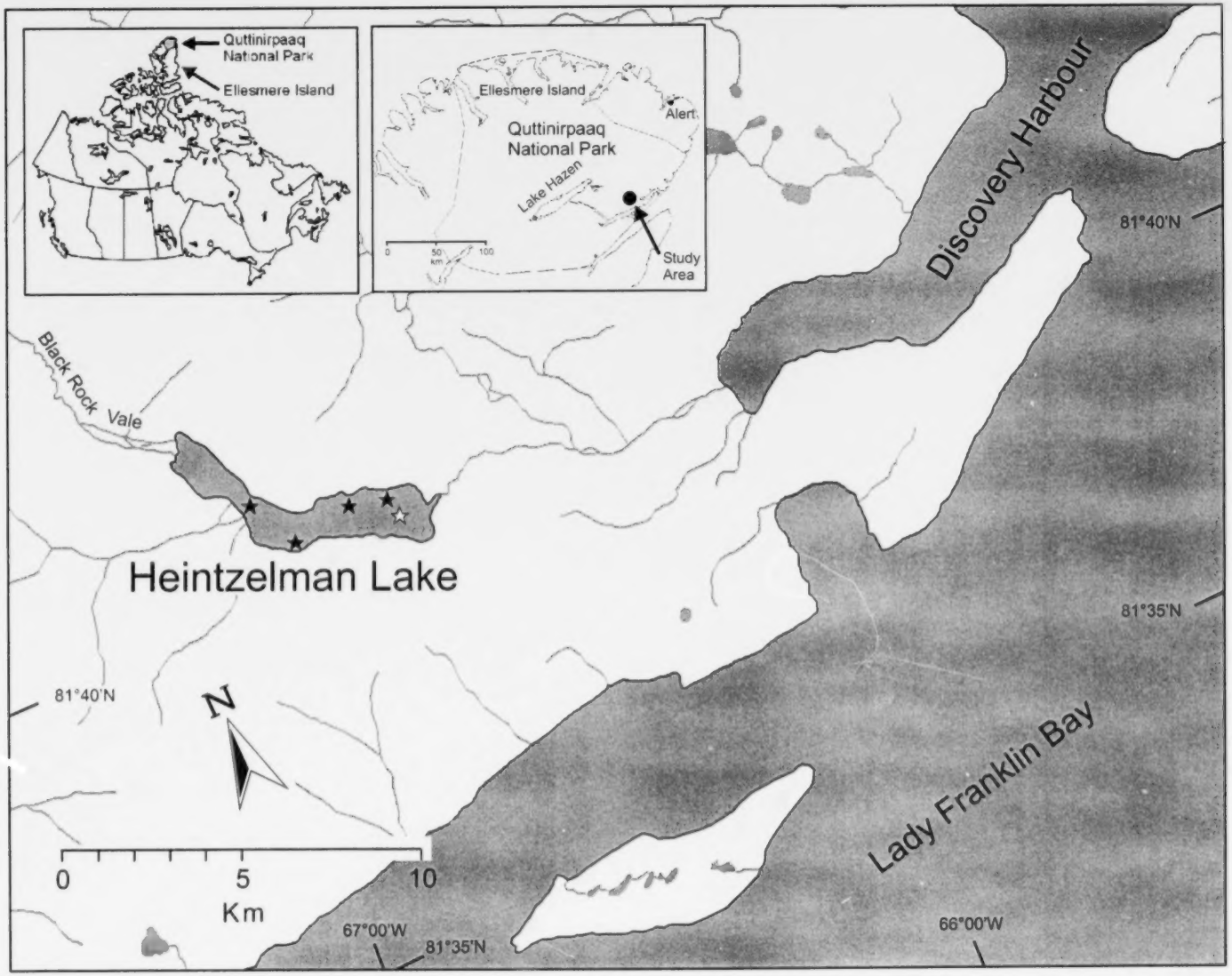

Figure 1. Map of the Heintzelman Lake area, Quttinirpaaq National Park, Nunavut. Stars indicate collection sites for Arctic char (open = May-June, 1995; solid = August, 2001).

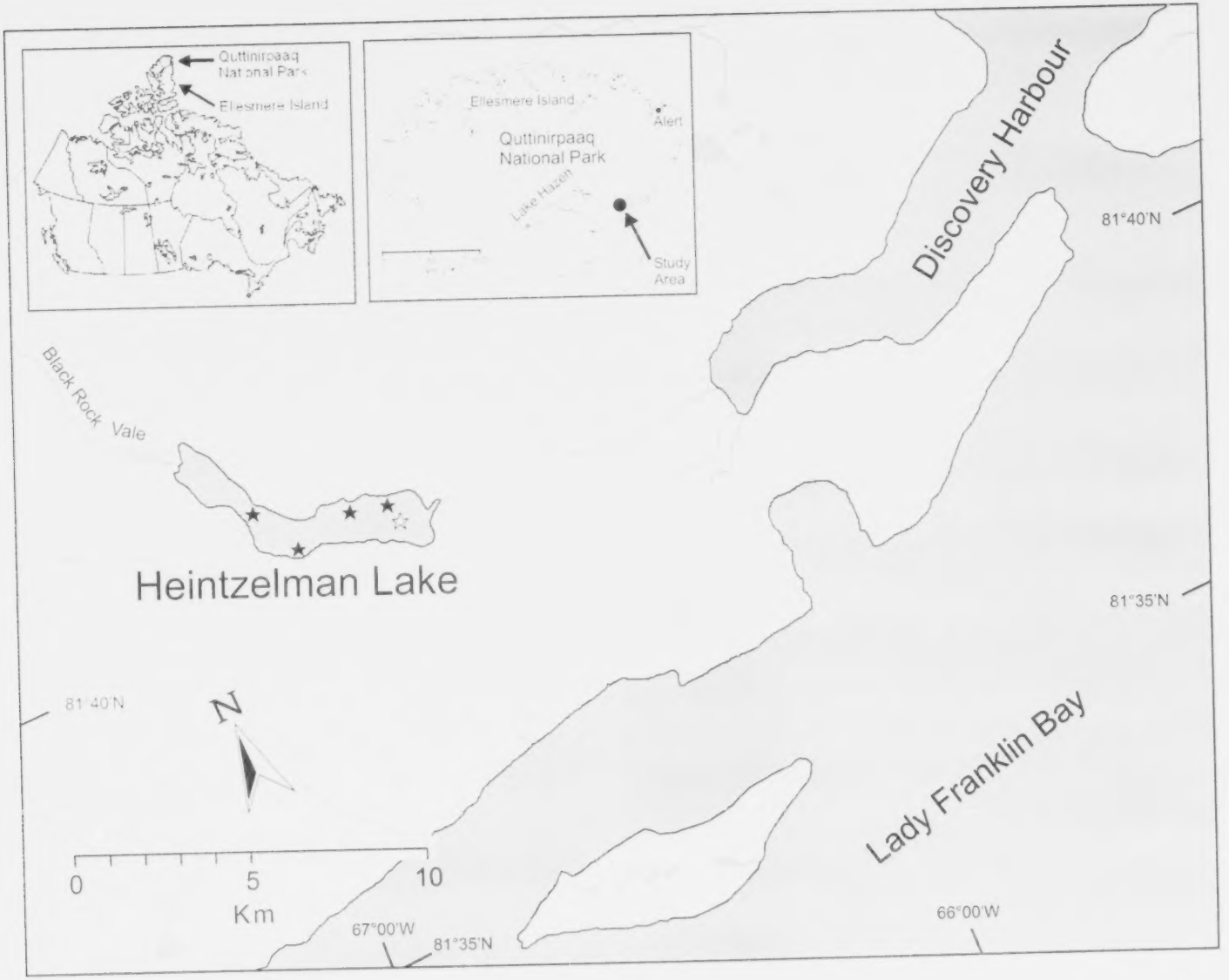

Figure 1. Map of the Heintzelman Lake area, Quttinirpaaq National Park, Nunavut. Stars indicate collection sites for Arctic char (open = May-June, 1995; solid = August, 2001).

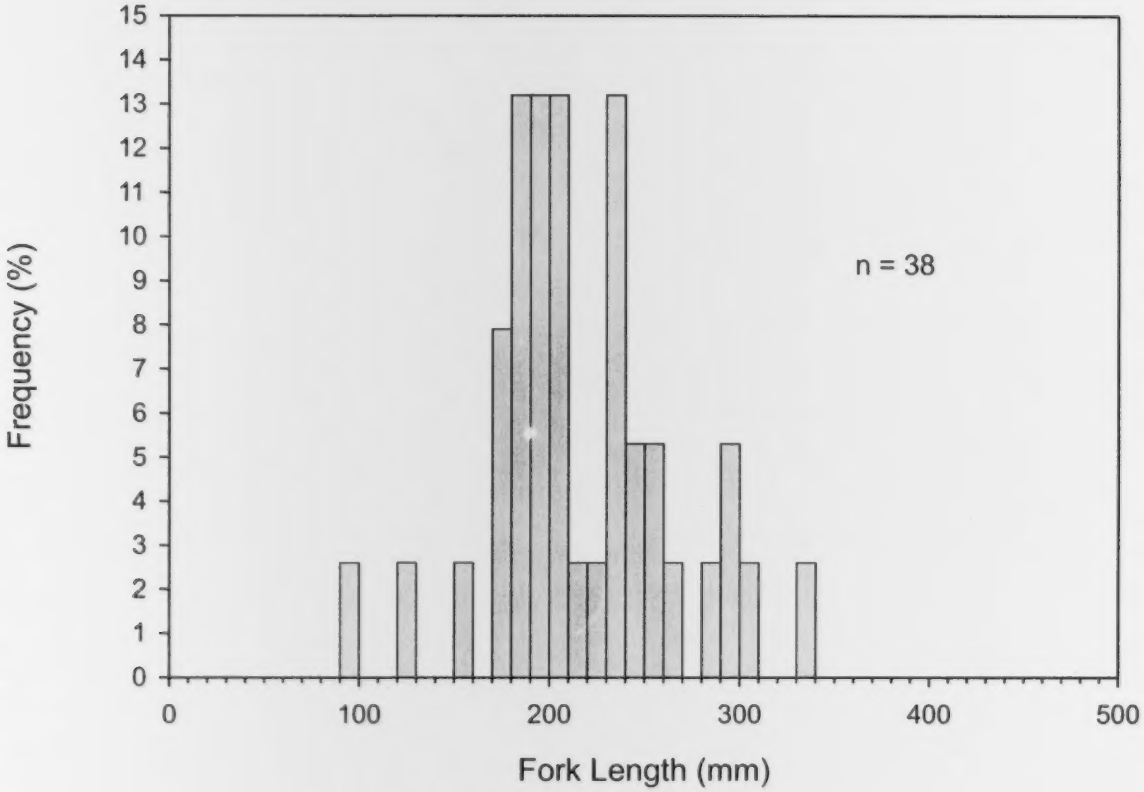

Figure 2. Length frequency distribution for Arctic char (combined sexes) captured in Heintzelman Lake in 1995.

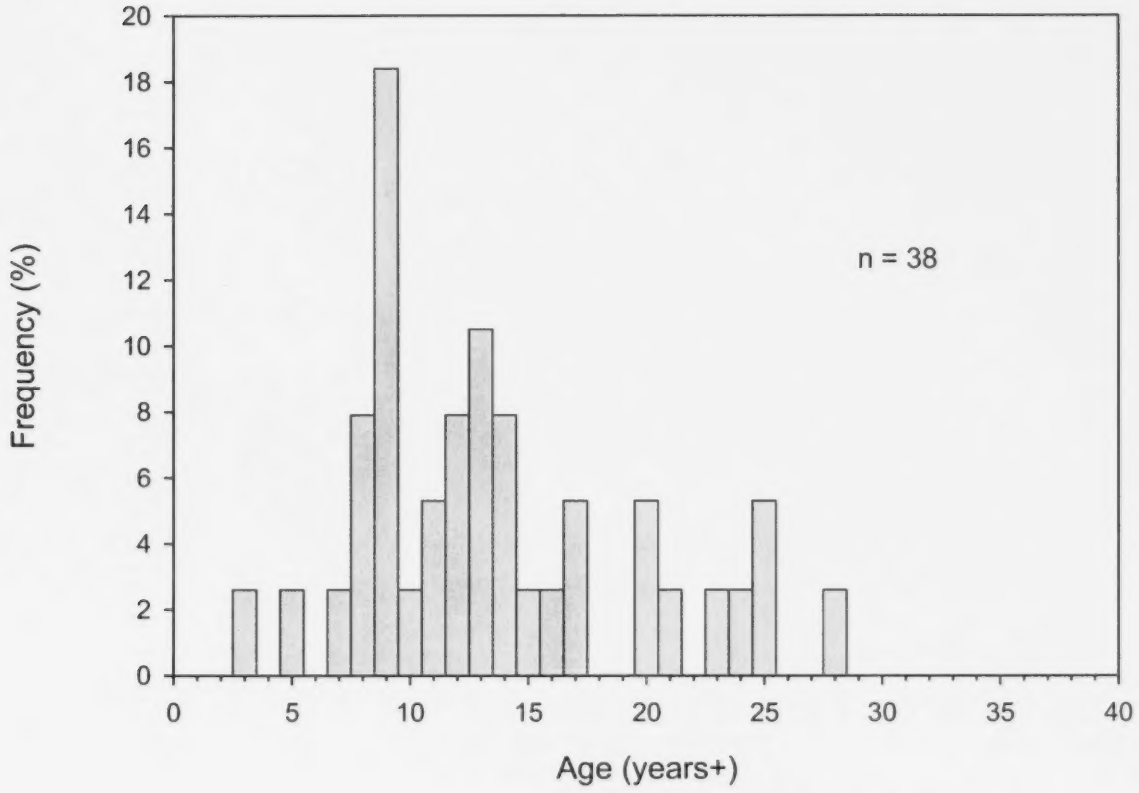

Figure 3. Age frequency distribution for Arctic char (combined sexes) captured in Heintzelman Lake in 1995.

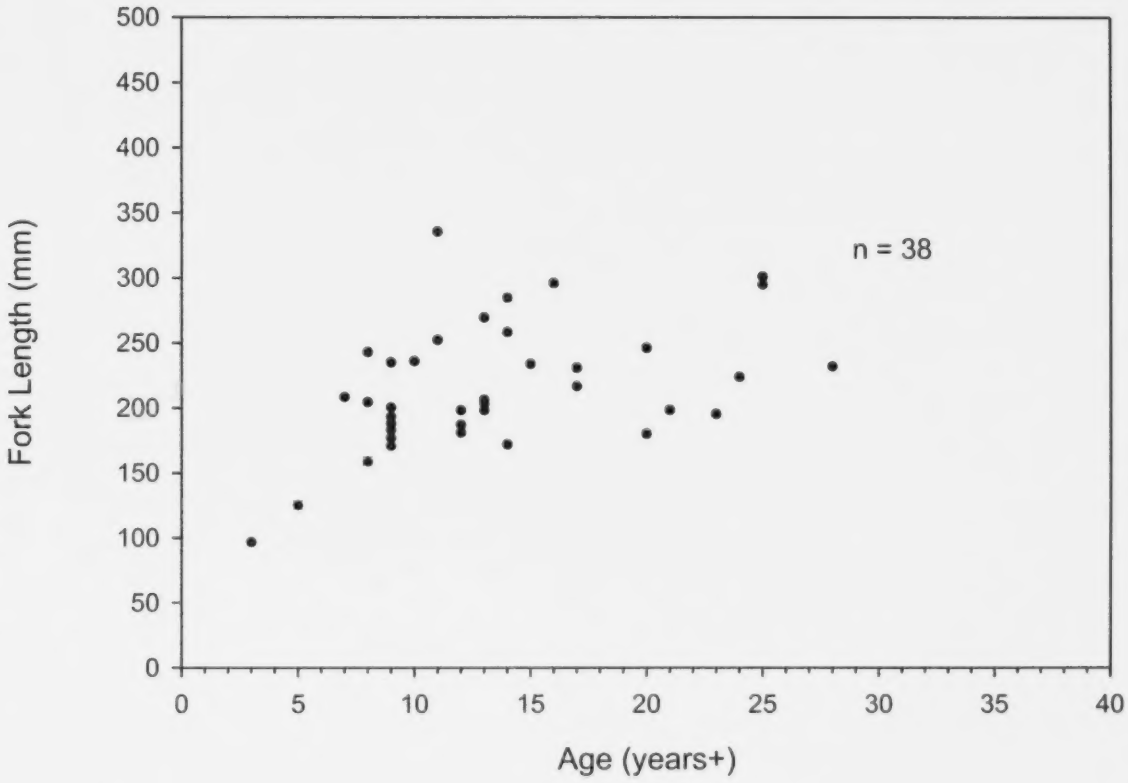

Figure 4. Relationship between fork length and age for Arctic char (combined sexes) captured in Heintzelman Lake in 1995.

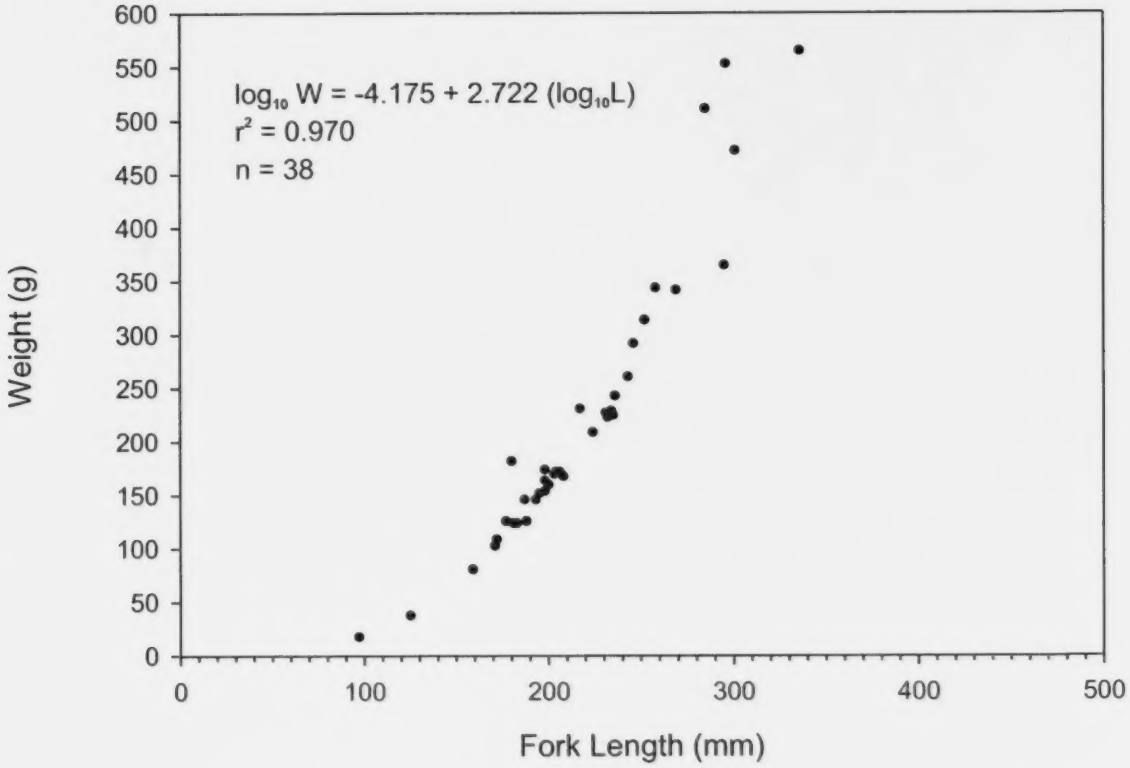

Figure 5. Relationship between weight and fork length for Arctic char (combined sexes) captured in Heintzelman Lake in 1995.

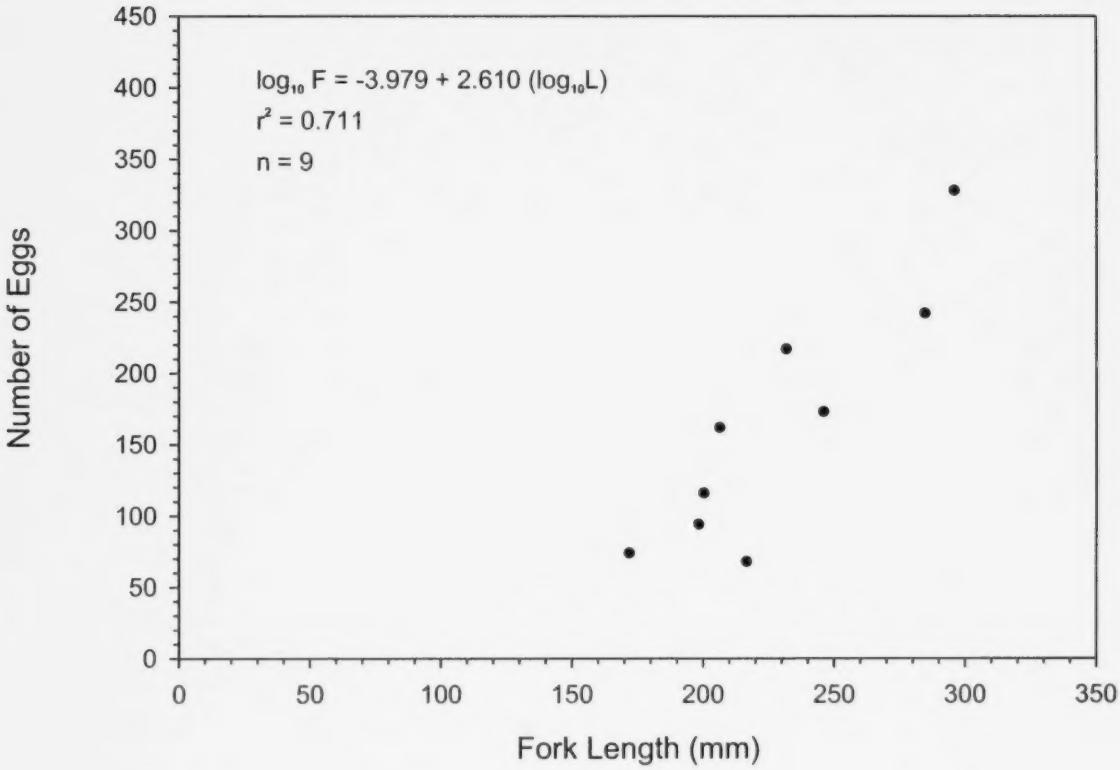

Figure 6. Relationship between fecundity (number of eggs) and fork length for Arctic char captured in Heintzelman Lake in 1995.

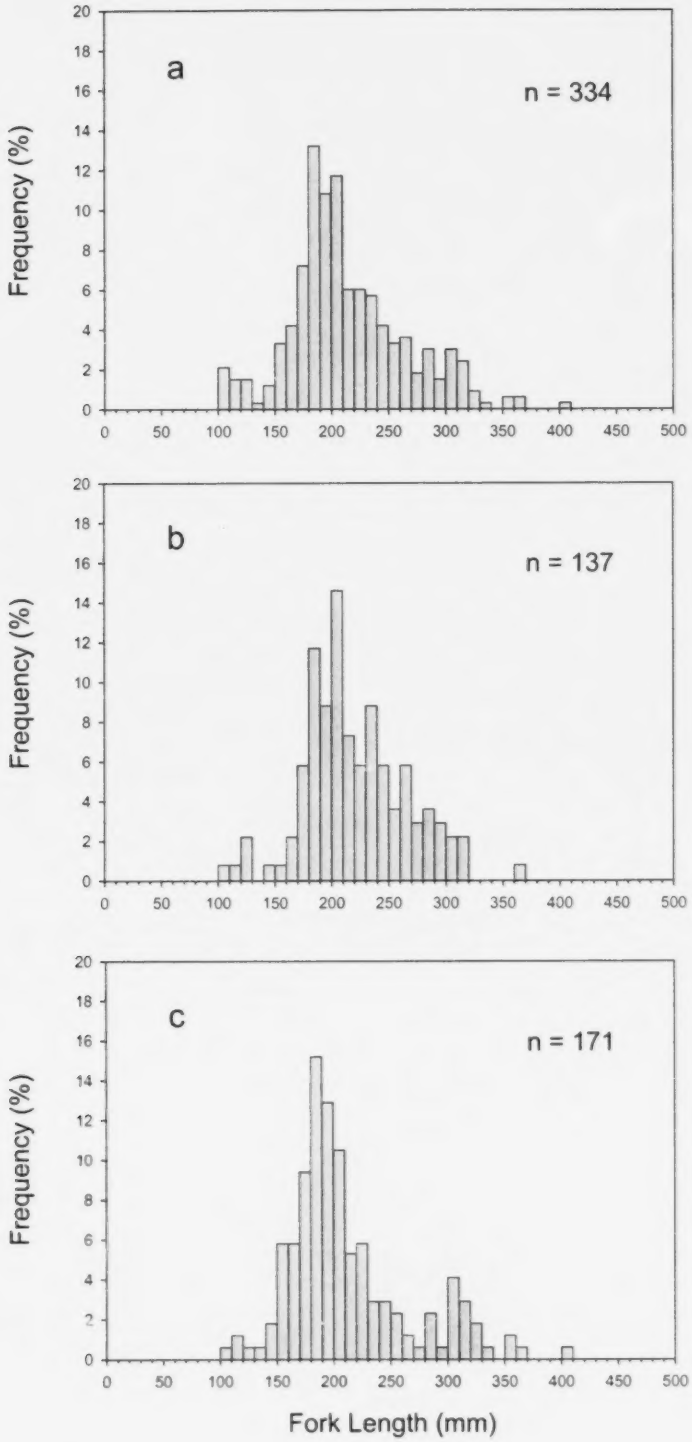

Figure 7. Length frequency distributions for Arctic char (a) combined sexes, (b) females, and (c) males captured in Heintzelman Lake in 2001.

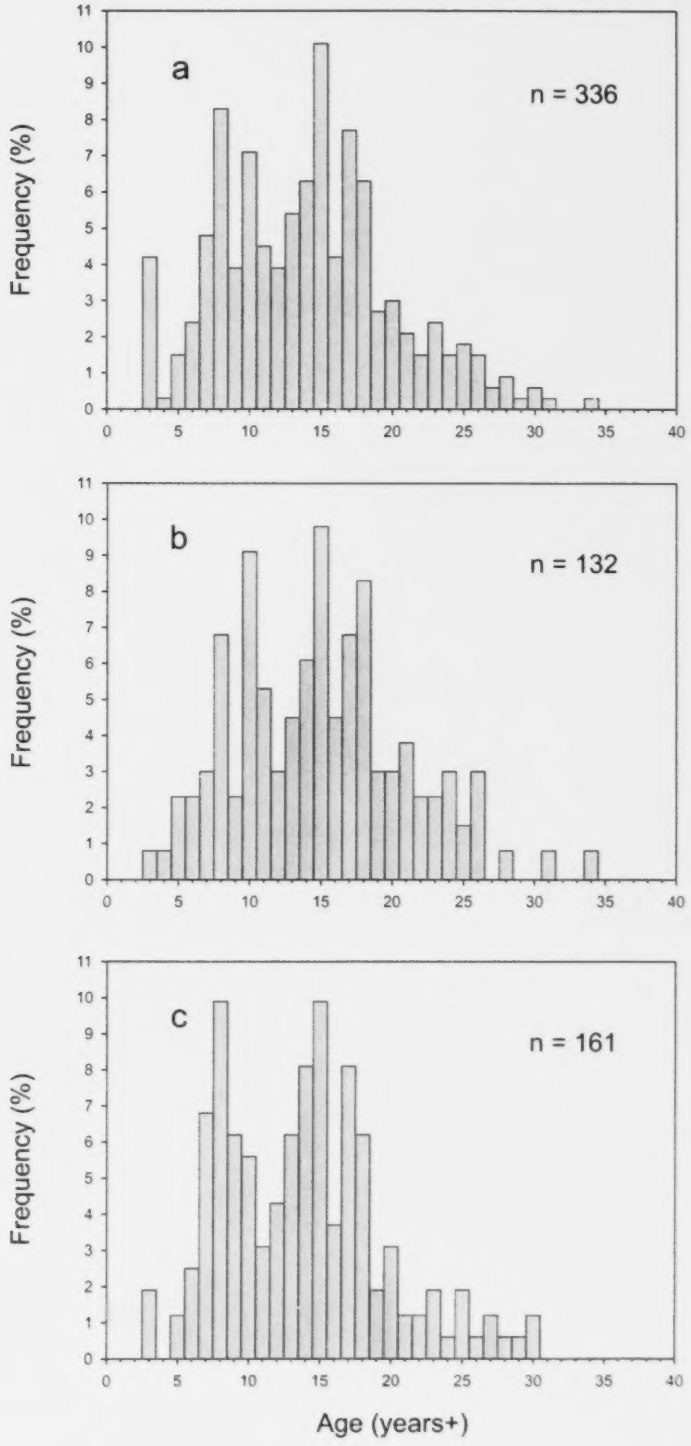

Figure 8. Age frequency distributions for Arctic char (a) combined sexes, (b) females, and (c) males captured in Heintzelman Lake in 2001.

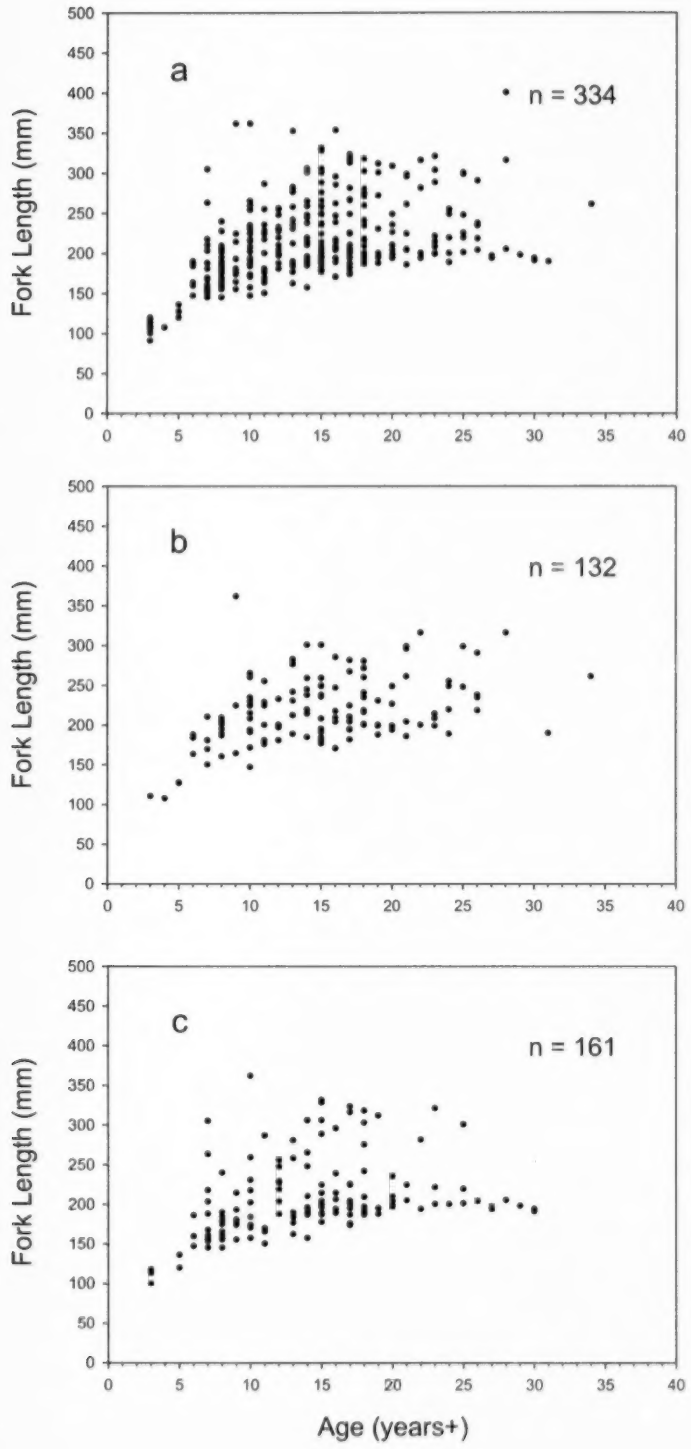

Figure 9. Relationship between fork length and age for Arctic char (a) combined sexes, (b) females, and (c) males captured in Heintzelman Lake in 2001.

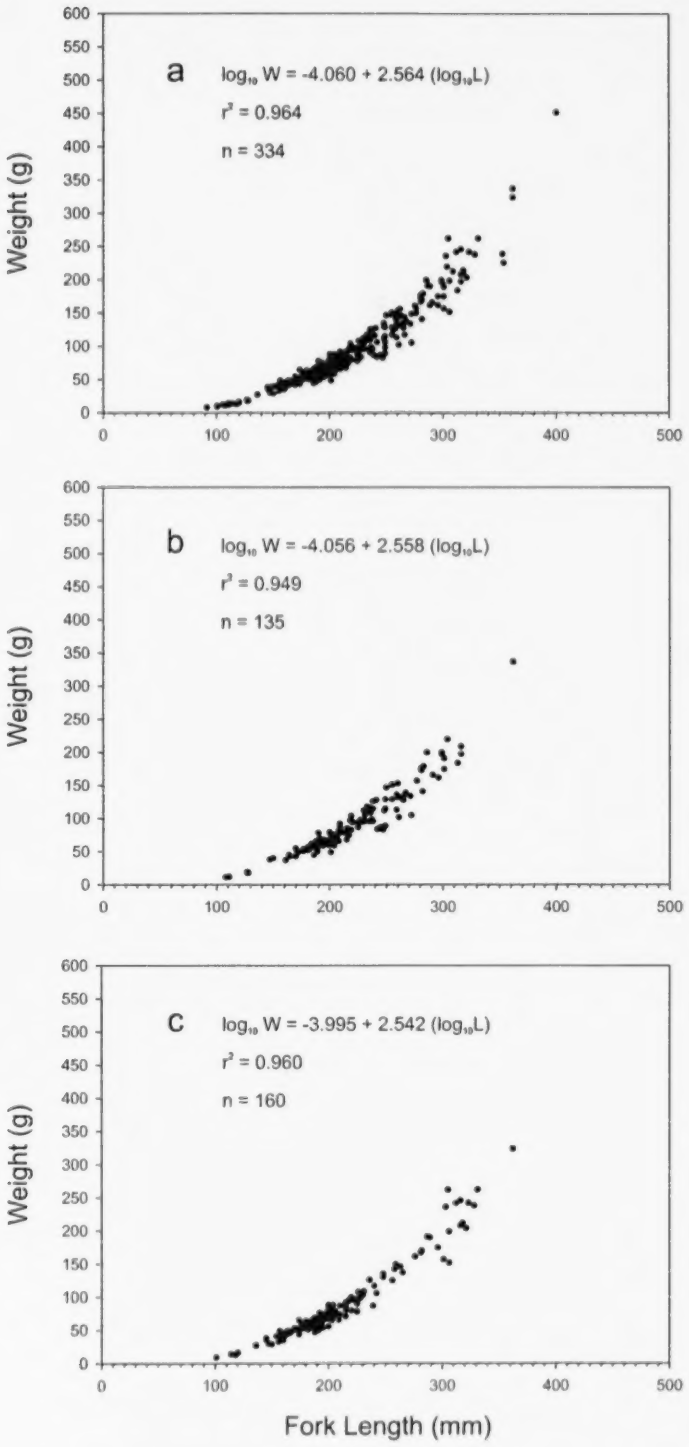

Figure 10. Relationship between weight and fork length for Arctic char (a) combined sexes, (b) females, and (c) males captured in Heintzelman Lake in 2001.

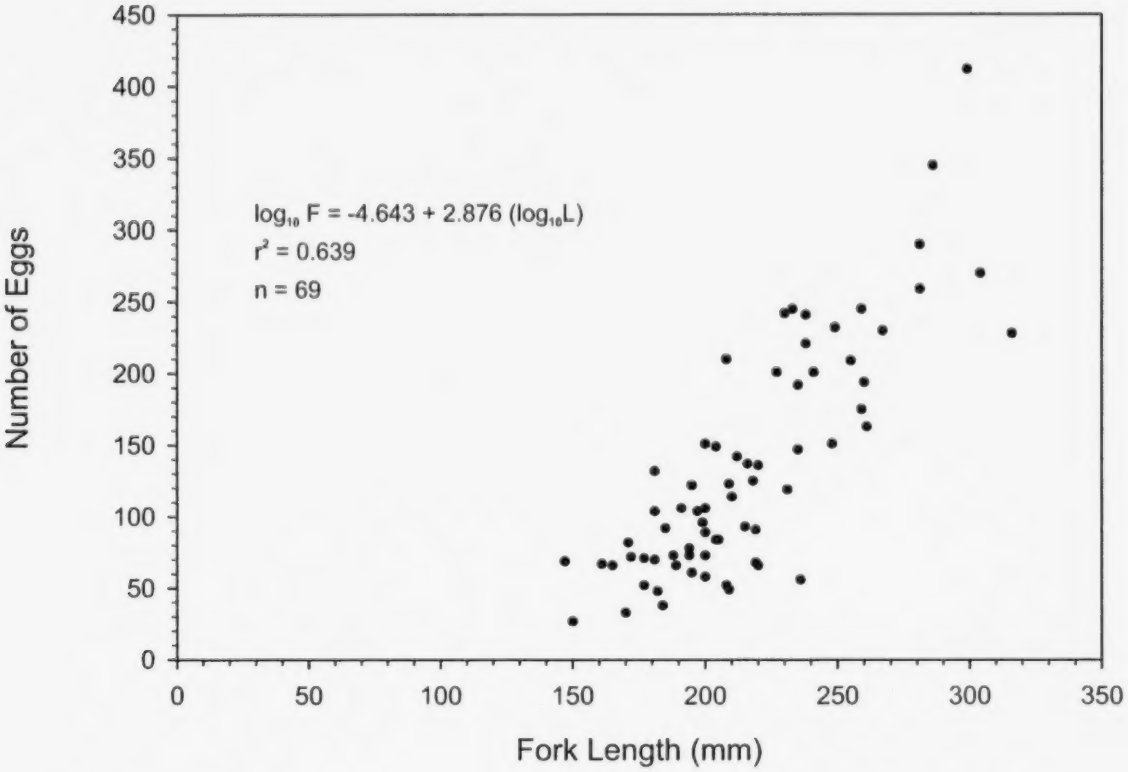

Figure 11. Relationship between fecundity (number of eggs) and fork length for Arctic char captured in Heintzelman Lake in 2001.